

**Yosio KOBAYASI* & Kazuko KONNO*: Watermoulds isolated
from soil in Tsushima Island (2)**

小林義雄*・今野和子*: 対馬の土壤等から分離した水棲菌 (2)

20. *Achlya americana* Humphrey in Trans. Amer. Phil. Soc. (N.S.) 17: 116 (1893); Nagai, Stud. Jap. Sapro. p. 16, pl. 3 fig. 22-25, pl. 4, fig. 1, 2 (1931); Johnson, *Achlya* p. 71, pl. 19, fig. E, F (1956).

Hyphae slender, sparingly branched, 15-55 μ thick. Zoosporangium *Achlya*-type. Encysted spores 8-10 μ . Oogonia densely arranged with short stalk on thick fertile hyphae, globose or pyriform, 50-100 μ (65-70 μ) in diameter, wall smooth, without projection, thin, pitted, containing 2-14 (4-6) spores. Oospores globose or subglobose 22-46 μ (23-28 μ), thin-walled, ochraceous, with a large eccentric oil drop. Antheridial branch not coiled, monoclinal or diclinal, attached on oogonia by projections or laterally appressed.

Hab. Isolated from soil No. 4 with hemp seed as bait.

21. *Achlya dubia* Coker. Sapro. p. 135 pl. 49 (1923); Johnson, *Achlya* p. 56 pl. 10 fig. A-C (1956).

Hyphae 20-75 μ thick, sparingly branched. Zoosporangia cylindric or long clavate, 300-350 \times 24-28 μ , apically pored, frequently producing dictyoid or thraustothecoid zoosporangia. Oogonia laterally and densely arranged on thick hyphae with short stalk, globose or pyriform, 45-90 μ in diameter, wall smooth, unpitted, containing 2-7 oospores. Oospores globose or subglobose, 26-35 μ , thick-walled, smooth, ochraceous, with an eccentric large oil drop, oogonial stalk slender, comparatively short, 26-117 \times 10-13 μ . Antheridial branch diclinal, laterally appressed.

Hab. Isolated from soil No. 30 and 18.

22. *Achlya hypogyna* Coker et Pemberton in Bot. Gaz. 45: 194 fig. 1-6 (1908); Johnson, *Achlya* p. 26 pl. 2 fig. J-P (1956).

Hyphae slender, 15-30 μ , thick, thin-walled, smooth, branched, terminal branches copiously ramose. Zoosporangia few terminal, clavate, 200-250 \times 35-50 μ . Cyst globose, 7-8 μ in diameter. Oogonia abundant, terminal or

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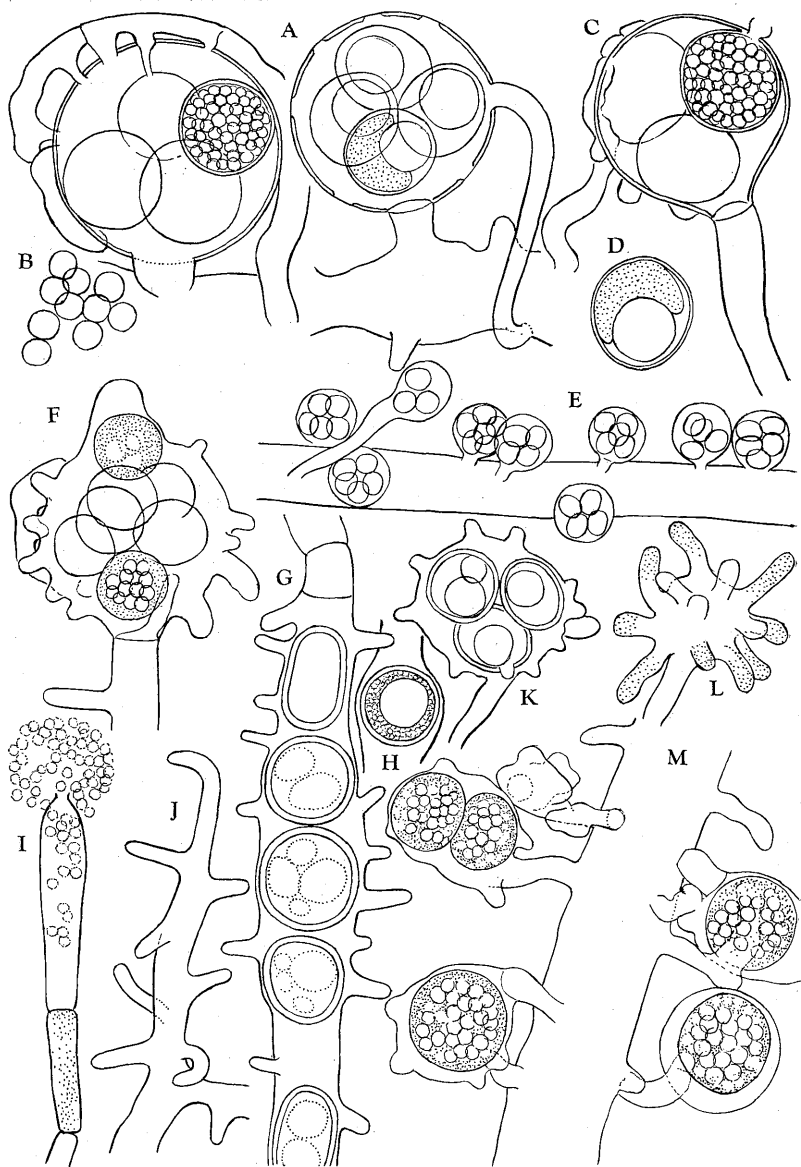


Fig. 3. A, B. *Achlya americana*. A. Oogonia & antheridia. B. Encysted zoospore. C-E. *Achlya dubia*. C. Antheridium & oogonium. D. Oospore. E. Fertile hypha with oogonia. F-H. *Achlya hypogyna*. F. Antheridium & oogonium. G. Intercalary oogonium. H. Oospore. I. Zoosporangium. J. Terminal branch of hypha. K-M. *Achlya recurva* K. Antheridia & oogonia. L. Irregular oogonium. (E, I $\times 130$, others $\times 1,000$)

intercalary, globose or cylindric, frequently catenate, distinctly with many papillae, 30–60 μ in diameter, unpitted, containing 1–5 or more oospores. Oospores globose or slightly ellipsoid, 20–28 μ in diameter, thick-walled, ochraceous, centric, subcentric or with 1-several oil drops. Antheridial branches usually lacking, declinous or hypogynous one produced.

Hab. Isolated from soil No. 55.

23. **Achlya recurva** Cornu, in Ann. Sci. Nat. Bot. Ser. 5 (15); 22 (1872); Johnson, Achlya p. 89 pl. 21 fig. A, D (1956).

Gemmae produced, irregularly branched. Oogonia abundant, lateral with short stalk, subglobose, 30–50 μ in diameter, wall unpitted, densely covered with wall ornamentations which are 5–25 μ long. Stalks comparatively thick and bent. Oospores globose or ellipsoidal, 1–3 or more in number, 20–30 μ in diameter, with 1–2 eccentric oil drops. Antheridial branches monoclinal or rarely androgynous.

Hab. Isolated from soil No. 14 and 31.

24. **Achlya** sp.

Hyphae thick, 20–70 μ , sparingly branched, straight. Gemmae abundant, filiform, clavate, forked or irregularly branched, commonly functioning as zoosporangia of *Achlya*-type. Oogonia globose or elongated, 85–125 μ or more long, smooth or sparingly papillate, unpitted, single or 2–3 catenate, containing 2–10 oospores. Oospores globose, 19–40 μ in diameter ochraceous, finely granulous.

Hab. Isolated from soil No. 34 and 49.

An unique characteristic of the species is the formation of branched gemmae.

25. **Aphanomyces laevis** De Bary f. **Keratinophilus** Ookubo et Kobayasi in Nagaoa 5: 5 figs. 4, 5 (1955).

Hyphae 5–8 μ in diameter, densely branched. Zoosporangia produced from undifferentiated vegetative hyphae, long or short hyphal, 32–80 \times 6–7 μ . Zoospores encysting upon emergence at the orifice; cysts globose, hyaline, 7 μ in diameter. Oogonia terminal on main hyphae or on lateral branches, globose or pyriform, single or catenate, hyaline or pale ochraceous, 24–33 μ in diameter, wall roughened, but without papillae. Oospores globose, 19–24 μ in diameter, pale ochraceous, somewhat thick-walled, smooth, contents fine granules with a large central or subcentral oil globule. Antheridia clavate,

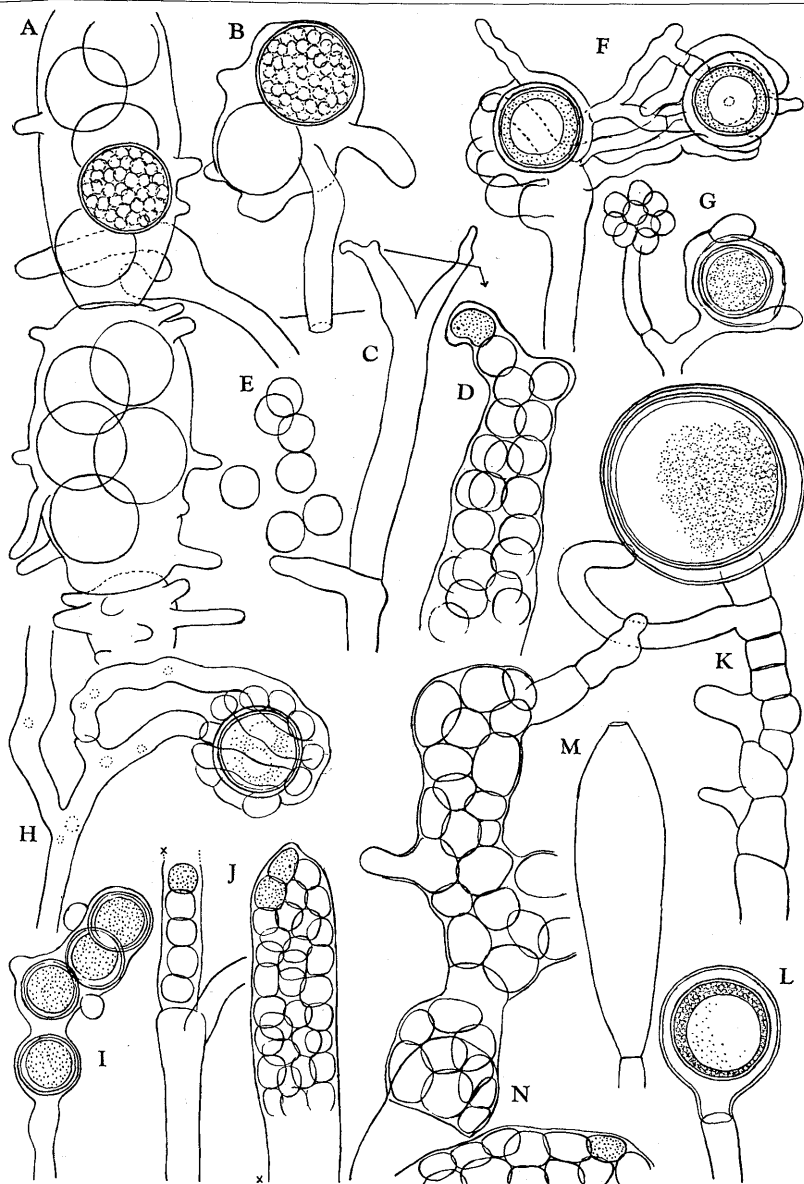


Fig. 4. A-E. *Achlya* sp. A, B. Antheridia & oogonia. C, D. Gemma functioning as zoosporangium. E. Encysted zoospore. F-G. *Aphanomyces laevis* f. *keratinophilus*. Antheridia, oogonia & zoosporangium. H-J. *Dictyuchus monosporus*. H, I. Antheridia & oogonia. J. Zoosporangium. K-N. *Dictyuchus* sp. K, L. Antheridium & oogonia. M. Zoosporangium. N. Intercalary branched zoosporangium. (C, I, M. $\times 1300$, others $\times 1,000$)

androgynous, stalk copiously branched.

Hab. Isolated from soil Nos. 18, 35, 40, 43, 51 and 56 using human hair as bait.

26. **Dictyuchus monosporus** Leitgeb. in Jahrb. Wiss. Bot. 7: 357 (1869); Nagai, Stud. Jap. Sapro. p. 27 pl. 7 fig. 7-11 (1931); Coker et Matthews, North. Amer. Fl. 2 (1); 52 (1937); Cejp. Flora CSR, Oomycetes p. 257 fig. 97-99 (1959).

Hyphae thick, sparingly branched, 19-35 μ thick, terminal branches long, slender, 6-7 μ thick. Zoosporangia laterally or apically produced, long clavate, 175-325 \times 20-25 μ , *Dictyuchus*-type only. Cyst globose 8-9 μ . Oogonia terminal on long branches, single or 2-4 catenate, ovoid, 20-28 μ in diameter, wall smooth, unpitted, containing a large oospore. Oospore globose, 17-25 μ , ochraceous, smooth, thick-walled, with a large centric oil drop. Antheridial branches vigorously branched, densely coiled around oogonia, androgynous origin, same thickness with oogonial stalk, 6-7 μ .

Hab. Isolated from soil No. 21.

So far as the authors' observation, all of the antheridial branches originate androgynously as illustrated by Cejp.

27. **Dictyuchus** sp.

Hyphae slender, 6.5-13 μ thick. Zoosporangia clavate, ellipsoid or irregularly branched, 75-150 \times 20-30 μ , *Dictyuchus*-type only. Cyst globose, 6.5-9 μ . Oogonia terminal on short or long branch, single or 2-3 catenate, globose or pyriform, rarely irregularly formed, 28-46 μ in diameter, smooth, unpitted, not so thick-walled, containing single oospore. Oogonial stalk frequently changed into zoosporangia. Oospore globose, single, thick-walled, ochraceous, 23-37 μ in diameter, smooth, with a subcentric large oil drop. Antheridial branch sparse, androgynous, apically appressed on oogonia.

Hab. Isolated from soil No. 2.

The most characteristic feature of this strain is the formation of the irregular zoosporangia.

28. **Saprolegnia** sp.

Hyphae 15-60 μ (15-25 μ) thick, growth limited. Zoosporangia terminal, clavate, 80-100 \times 20-25 μ , *Saprolegnia*-type.

Oogonia commonly terminal, globose, smooth or with several papillae, frequently catenate, 16-24 μ , producing a large oospore. Oospores globose,

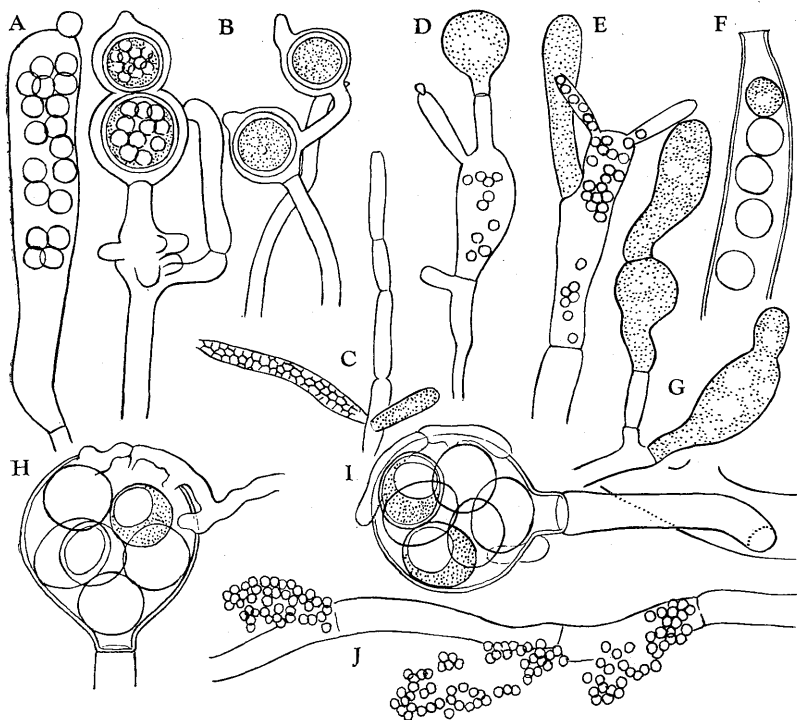


Fig. 5. A-C. *Saprolegnia* sp. (no. 28). A. Zoosporangium. B. Antheridia & oogonia. C. *Dictyuchus*-type zoosporangia. D-G. *Saprolegnia* sp. (no. 29) Gemmae, partly functioning as zoosporangia, and normal zoosporangium (F). H-J. *Thraustotheca clavata*. H, I. Antheridia & oogonia. J. Zoosporangia. (C, D, E, F, G, J $\times 130$, A, B, H, I $\times 1,000$)

18-22 μ in diameter, thick-walled, contents granular, without large oil drop. Antheridia scarce, probably producing oospores parthenogenetically.

Hab. Isolated from soil No. 41.

Sexual organs of this strain seem to be near those of *Dictyuchus monosporus*, although the sporangia are the *Saprolegnia*-type.

29. *Saprolegnia* sp.

Hyphae extending, 15-50 μ thick. Gemmae produced from hyphae or zoosporangia terminally or laterally, globose, clavate or irregularly branched, frequently catenate, ochraceous. Zoosporangia terminal, clavate, proliferate, 125-250 \times 25-40 μ , with 1-2 long discharge-tube, frequently producing gemmae,

rarely forming *Dictyuchus*-type zoosporangia ($200 \times 15 \mu$). Sexual organ unknown.

Hab. Isolated from soil No. 43.

In the characteristics of gemmae and papillate zoosporangia, the present strain seems to be near *Saprolegnia litoralis* Coker.

30. ***Thraustotheca clavata*** (De Bary) Humphrey in Trans. Amer. Phil. Soc. 17: 131 (1893); Coker, Sapro. p. 148 pl. 51 (1923); Coker et Matthews, North Amer. Fl. 2(1): 51 (1937); Cejp, Flora CSR, Oomycetes p. 277 fig. 107 (1959).

Hyphae in strong clusters, 7–26 μ thick, branched. Zoosporangia terminal short clavate, $135\text{--}210 \times 57\text{--}80 \mu$, hyaline, wall disintegrated at maturity. Zoospores globose, 10–13 μ in diameter, encysting within the sporangia. Oogonia with long stalk on the secondary hyphae, pyriform, moderately thick-walled, smooth, seemingly unpitted, 40–50 μ , containing 2–12 (4–6) spores. Oospores ovoid or subglobose, 16–22 μ , smooth, thick-walled, hyaline with an eccentric large oil globule. Antheridia diclinous or androgynous, 4–5 μ thick, laterally appressed or intercalarily attached.

Hab. Isolated from soil No. 19.

31. ***Allomyces anomalus*** Emerson in Lloydia 4: 133 (1941); Sparrow, Aquat. Phyc. ed. 2. p. 678 fig. 40 D–E (1960).

Hyphae 11–14 μ thick. Resting spores $44\text{--}50 \times 33\text{--}40 \mu$, ochraceous, finely pitted, 6–7 pits in 10 μ , contents finely granular.

Hab. Isolated from soil No. 1, 32 and 52, using hemp seed as bait.

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対馬は九州本土と朝鮮との中間にあって植物分布上重要な地点の一つであるにも拘らず、その菌類の研究はほとんど行われて居らない。ことに水棲菌の研究は皆無である。

今回は対馬の土壌生水棲菌について調査を行った。1969年度国立科学博物館日本列島総合研究の一部である。1969年10月16日から23日に至るまで、対馬の南端から北端に至る59ヶ所を撰び、土壌を採集し、研究室で種々の餌料を用いて釣り出したものである。土壌は出来る限り環境の異なる代表的地域のものを撰び、中には水棲菌の見出せそうもない場所も含めた。即ち海岸の波打際から、最高の御岳山頂に至るまで、水田・山林・河原・池・耕作地・路傍・墓地・社叢等々である。結果に於ては水田の土が一番水生菌が豊富であった。これは年間数ヶ月は栄養分に富んだ停水であり、其他の期間は乾田となっている特殊環境のためである。総計31種であり、多くは広分布種であって、分布的には対馬の位置を特徴づけるものは見出し得なかった。しかし只一回の調査で新種1、日本に於ける新分布種9種も見出されたことは、如何にこの分野が未開拓のものであるかを明らかに示している。